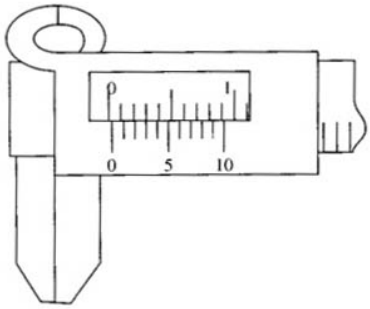
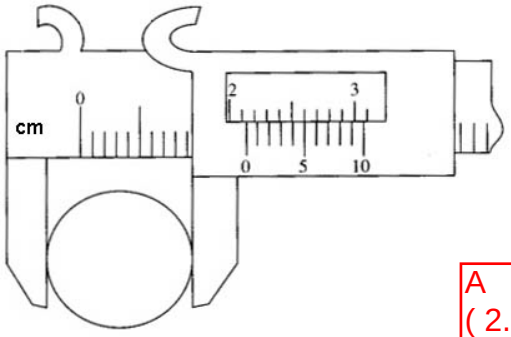
2009 3E EOY questions

Paper 1 MCQ

1 The diagram below shows a vernier caliper before and after the measurement of the diameter of a pendulum bob. What is the diameter of the pendulum bob?



BEFORE



AFTER

A
(2.15-0.03)

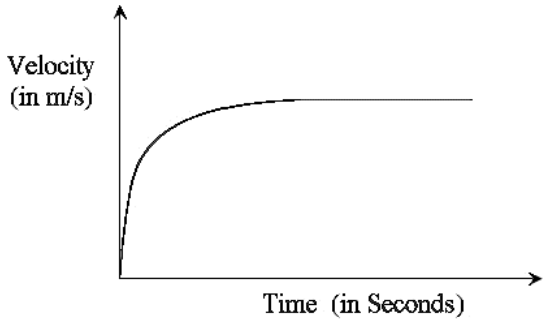
A 2.12 cm **B** 2.15 cm **C** 2.16 cm **D** 2.18 cm

2 Jason wants to measure the period of a pendulum. Which instrument should he use?

A Micrometer screw gauge
B Stopwatch
C Meter Rule
D Hourglass

B

3 The graph below shows the velocity-time graph of a car.



Which of the following can be deduced from the graph?

A The car decelerates until it stops.
B The car first decelerates, and then moves with a steady velocity.
C The car accelerates uniformly.
D The car first accelerates, and then moves with a steady velocity.

D

4 A ball falls freely near the surface of the Earth. Which quantity remains constant?

A Acceleration
B Distance traveled in 1 s
C Speed
D Velocity

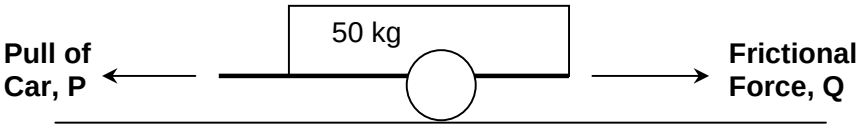
A

5 The weight of a gas-filled balloon is 150 N. The balloon rises at a constant speed of 3 ms^{-1}. What is the resultant force acting on the balloon during this ascent?

A 0 N **B** 50 N **C** 150 N **D** 450 N

A (zero resultant force)

6 The diagram shows the horizontal forces acting on a trailer of mass 50 kg, as it is pulled along a road by a car. There are no other horizontal forces acting on the trailer.

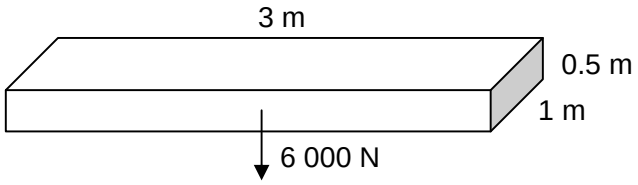


Which pair of values of **P** and **Q** will cause the trailer to have a constant acceleration of 3 ms^{-2}.

	P	Q
A	50 N	100 N
B	100 N	50 N
C	200 N	50 N
D	100 N	100 N

C (resultant force = 50 x 3 = 150N)

7 A tank has dimensions 3 m long, 1 m wide and 0.5 m deep is filled with oil of weight 6 000 N. What is the pressure on the base of the tank due to the oil?



A(use p=F/A; 6000/3)

A 2 000 Pa **B** 3 000 Pa **C** 4 000 Pa **D** 9 000 Pa

8 Which one of the following correctly compares the mass and weight of an object on the Earth and on the Moon?

	Mass on Earth and on Moon	Weight on Earth and on Moon
A	Same	Same
B	Same	Different
C	Different	Same
D	Different	Different

B

9 A pupil carries out an experiment with a beaker and some liquid, and obtains the following results:

Mass of beaker	96 g
Mass of beaker with 100 cm^3 of liquid	184 g

What is the density of the liquid?

B(use d=m/v; 88/100)

A 0.84 g cm^{-3} **B** 0.88 g cm^{-3} **C** 0.96 g cm^{-3} **D** 1.84 g cm^{-3}

10 Fig 10 below shows a driver's foot applying a force of 20 N on a car pedal. With what force is the spring pulled?

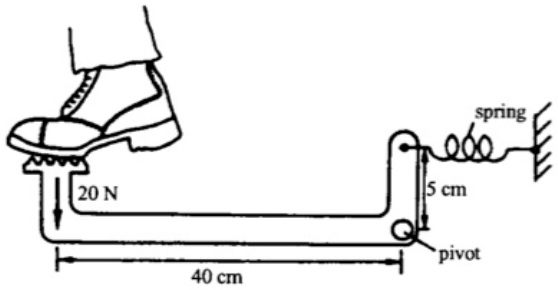
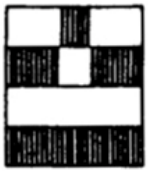


Fig. 10

D(use P.O.M.; 20 x 40 = F x 5)

A 2.5 N **B** 10 N **C** 100 N **D** 160 N

11 The diagram below shows 4 different arrangement of books on a bookshelf. Which one of the bookshelf is the **least stable**?

A  **B**  **C**  **D** 

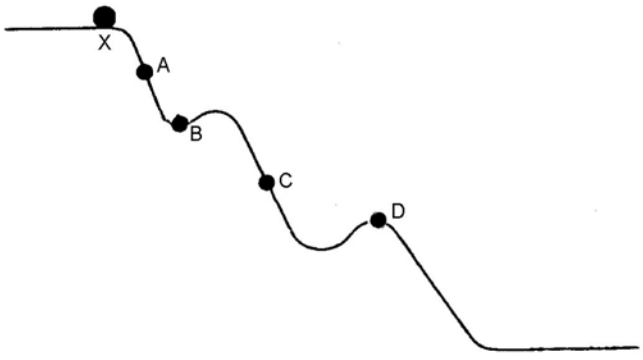
A (high c.g.)

12 A crate of mass 200 kg is raised from the ground to a height of 15 m. What is the gain in gravitational potential energy of the crate? (Take g = 10 N / kg)

A 133 J **B** 2 000 J **C** 3 000 J **D** 30 000 J

D (use mgh)

13 A ball rolls down the hill, starting at **X**, as shown below. At which point does the ball have the maximum speed?



D (all gpe converted to ke)

14 Which of the following examples gives the greatest power?

A A man of mass 60 kg running up a flight of stairs 4 m high in 3 s.
B A weight of 800 N lifted by a crane to a height of 6 m is 8 s.
C 12 000 J of work done by a windmill in 12 s.
D 18 000 J of work done by a windmill in 12 s.

D (Use P= W/t to find out)

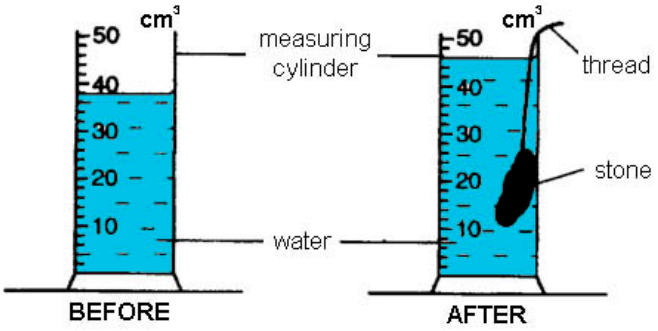
Paper 2 Section A [45 MARKS]

Answer **all** the questions in the space provided.

1 Complete the table below. (The first row has been completed as an example.) [2]

Quantity to be measured	Name of the instrument used to measure the quantity	Smallest unit measured by instrument
Eg: Mass of a person	**Eg:** Bathroom scale	**Eg:** 1 kg
Time taken for 20 oscillations of a pendulum	Stopwatch	0.01s
Diameter of a pendulum bob	micrometer screw gauge	0.01 mm

2 An irregular-shaped pebble is dropped into measuring cylinder containing some water.



(a) What is the volume of the pebble? [1]

Vol. = 46 - 38 = 8 cm3

(b) Given that the pebble has a mass of 54 g, find the density of the pebble. [2]

d=m/v
= 54/8
= 6.75g/cm3

3 A box of chocolates of mass 2 kg is brought from the Earth to the Moon. Given that the gravitational field strength on the Earth and the Moon are 10 N/kg and 1.6 N/kg respectively, find

(a) the weight of the chocolates on Earth. [1]

W= mg
= 2 x 10 = 20 N

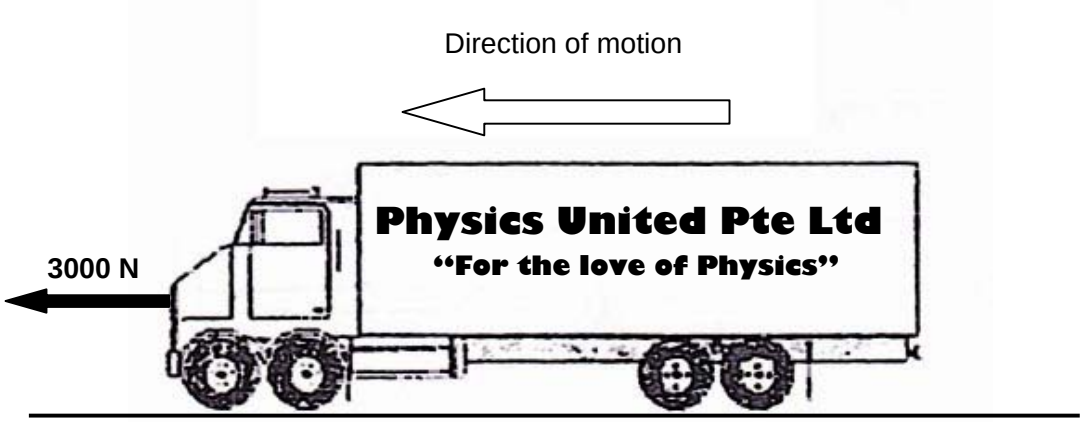
(b) the mass of the chocolates on the Moon. [1]

mass = 2 kg (same object of the same mass)

(c) the weight of the chocolates on the Moon. [2]

W= mg
= 2 x 1.6
= 3.2 N

4 A truck of mass 2500 kg, has a driving force of 3000 N and is moving at a constant speed of 8 ms^{-1}.



(a) Explain why a driving force is needed to keep the truck moving at a constant speed. [2]

For the truck to move at constant speed, resultant force is zero. Hence, a forward force is required to overcome air resistance and frictional forces acting on the truck.

(b) **(i)** State the frictional force that the truck is experiencing. [1]

Since resultant = 0, forward force - friction = 0
i.e friction = 3000 N

(ii) What is the work done by friction, if the truck moves a distance of 200 m? [2]

Work done = Force x distance
= 3000 x 200 = 600 000 J

(c) Find the kinetic energy of the truck. [2]

k.e. = 0.5 mv2
= 0.5 x 2500 x (8)squared
= 40 000 J

The driving force is now increased to 5000 N, and assuming the frictional force remains the same,

(d) find the acceleration of the lorry. [2]

New resultant force = 5000 - 3000
= 2000 N
Use f=ma, a = 2000/2500 = 0.8 m/s2

(e) Explain why a truck is more stable when its wheel axles are placed further apart. [1]

When the wheel axles are further apart, the base is broaden, hence the center of gravity is lowered.

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5 A stunt car Is being driven on one side as shown in the diagram below. The weight of the driver, W_D, is 700 N.

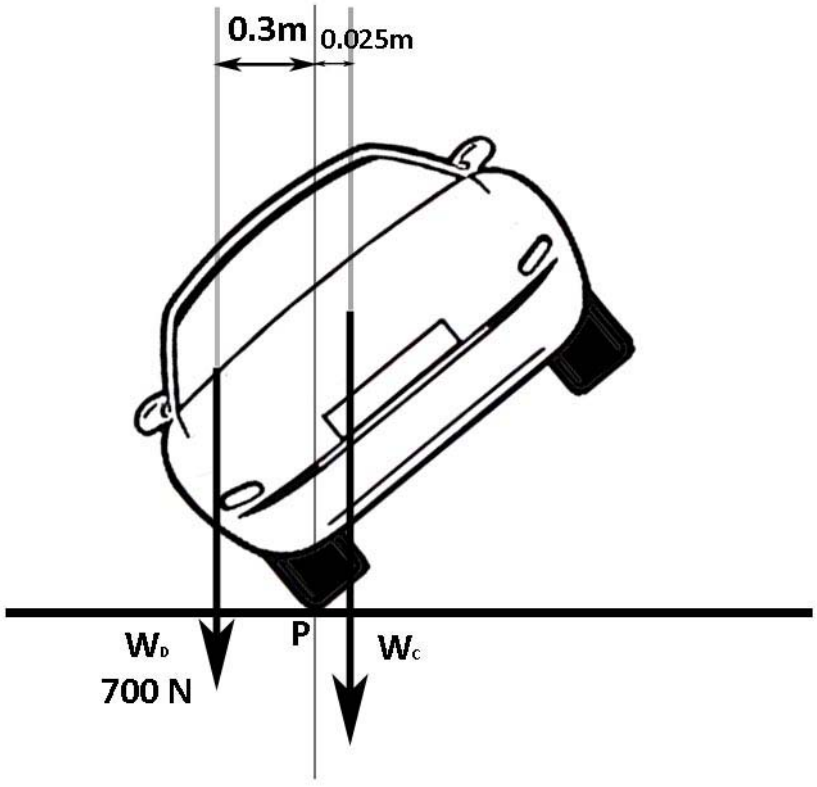


Fig. 5

(a) Calculate the moment of the weight of the driver, W_D, about the pivot, **P**. [1]

M = F x d
= 700 x 0.3 = 210 Nm

(b) Using the Principle of Moments, calculate the weight of the car, $\mathbf{W_C}$, using the measurements as shown in Fig. 5. [2]

Use P.O.M, taking pivot about P,
210 Nm = Wc x 0.025
Wc = 8400 N

(c) What type of equilibrium is the car in? [1]

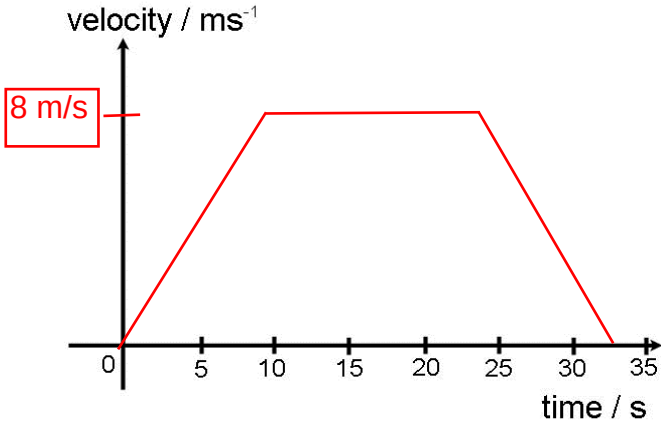
Stable equilibrium ……

Section B [20 MARKS]

Answer any **two** questions from this section in the space provided.

10 A car accelerates uniformly from rest for 10 seconds. It then travels at a constant speed of 8 ms^{-1} for the next 15 seconds. The brakes at now applied, and the car comes to a complete stop in 8 seconds.

(a) Draw the velocity-time graph of the car on the axes provided below. [3]



(b) **(i)** Calculate the acceleration of the car in the first 10 seconds. [1]

acceleration = (8-0)/10 = 0.8m/s2

(ii) Given that the car has a mass of 1200 kg, calculate the resultant force acting on the car for the first 10 seconds of the journey. [2]

F = ma
= 1200 x 0.8
= 960 N

(c) Calculate the distance traveled by the car after the brakes are applied. [2]

Distance travelled = area under graph
= 0.5 x 8 x 8
= 32 m

(d) The car is now going around a semi-circular bend at a speed of 6 ms^{-1}. [2]
Robin says that the velocity of the car is not constant. Is he correct?
Explain your answer.

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